



Automated Weather Observing System

Maintenance Manual

3000-027

Rev. E



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Latest Manual Version

For the latest version of this manual, see the *Product Manuals* page under *Reference* on our web site at www.allweatherinc.com/.



**All Weather, Inc.
1165 National Drive
Sacramento, CA 95834
Tel.: (916) 928-1000
Fax: (916) 928-1165**

Contact Customer Service

- **Phone** support is available from 8:00am - 4:30pm PT, Monday through Friday. Call 916-928-1000 and ask for "Service."
- **Online** support is available by filling out a request at www.allweatherinc.com/customer/support.html
- **E-mail** your support request to support@allweatherinc.com

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Overview

This manual provides instructions for inspecting and revalidating All Weather, Inc. (AWI) AWOS 3000 systems. It includes complete maintenance instructions, as well as forms for recording the results of monthly, triannual, and annual maintenance procedures.

1.1 System Description

A full description of the AWOS 3000 can be found in the ***AWOS 3000 System User's Manual*** (3000-001), which includes system drawings, descriptions of software operation and interfaces, and the available sensor and component configurations of an AWOS.

This manual covers all AWOS systems. Please refer to the ***AWOS 3000 System User's Manual*** (3000-001) for the configuration details for each AWOS model.

1.2 System Performance Parameters

System performance parameters are given in the individual sensor and component manuals. Detailed specifications are provided for each component. An overall description of the AWOS system's performance parameters can be found in the ***AWOS 3000 System User's Manual*** (3000-001).

1.3 Scheduled Maintenance

Scheduled maintenance is performed on AWOS systems at three intervals: monthly, triannually, and annually. Records of these procedures, along with any adjustments or repairs made, are recorded on the maintenance forms at the back of this manual.

1.3.1 Data Recording Forms

Three data recording forms are included with this manual — the *Monthly Technical Performance Record*, the *Triannual Technical Performance Record*, and the *Annual Technical Performance Record*. These forms are used during periodic maintenance, and include space to record the results of scheduled maintenance procedures. In addition to annual revalidation, the *Annual Technical Performance Record* is to be completed at system commissioning and after major repair work. These master forms should be copied and sufficient copies stored at a convenient location in each site's Facility Reference Data File (FRDF).

1.4 Site Preparation

Individual Site Preparation Manuals are available for each AWOS configuration. Site Preparation Manuals contain the instructions and drawings necessary for completing trenching, foundation construction, and other site preparation work required prior to installation of an AWOS.

1.5 Installation & Checkout Manual

The **AWOS 3000 Installation Manual** (3000-017) provides complete installation and checkout procedures for all AWOS systems.

1.6 Operating Instructions

Overall system operating instructions can be found in the **AWOS 3000 System User's Manual** (3000-001). Operating instructions for individual sensors and components can be found in their respective manuals. The **Operation** chapter of each manual provides full instructions for using a component and for interpreting that instrument's data.

1.7 Training Program

AWOS technicians are fully qualified in electronic and electrical applications, and have comprehensive knowledge of the operations, testing, and maintenance of the AWOS to the board component level. They have the capabilities to evaluate and make recommendations for system component changes that would enhance the reliability or functionality of the AWOS.

AWI provides a comprehensive training and certification program for all AWOS technicians to ensure thorough knowledge and competence in working with AWOS systems. The training is documented in the **AWOS 3000 Maintenance Training Course** (3000-044).

1.8 AWOS Field Replaceable Units (FRUs)

When an AWOS component or sensor fails, consult the troubleshooting chart in Chapter **Error! Reference source not found.** to identify the Field-Replaceable Unit (FRU) to replace. If the problem persists or cannot be narrowed down from the troubleshooting chart, please contact All Weather, Inc. Customer Service.

Table 1 lists the lowest replaceable units (FRUs) for the AWOS 3000. When a sensor is replaced, the annual procedure for that sensor must be performed.

Table 1. AWOS FRUs

Description	Model/Part No.	Option
DATA COLLECTION PLATFORM		
PCB AWOS Data Collection	M404804	
Main Daughter Board	M487094	
DCP Firmware	M488290-00	
Sensor Interface Controller	M404806	
Ceilometer Interface Firmware	M469075	
Ultrasonic Wind Interface Firmware	M469076-00	
Freezing Rain Interface Firmware	M469066	
Power Supply Assembly	M438210-00	
Fuse 0.5 A Slow Blow	M442060	
Fuse 5 A Slow Blow	M442070	
Fuse 10 A Slow Blow	M442071	
AC Power PCB Assembly	M404802	
Data Link Radio	20980-A	✓
Barometric Pressure Sensor*	7190	
Quad Plate Pressure Port	M105037	
* The Model 7190 Barometric Pressure Sensor is installed on the Data Collection Platform.		
CENTRAL DATA PLATFORM		
CDP	3000	
Monitor	M482179-00	
CPU Board	M406186-00	
Keyboard/Mouse	M406187-00	
DVD/CD Drive	M406190-00	
Power Supply	M438222-00	
Telephone Modem	M406159-00	
Microphone	20906	
Data Link Radio	20980-A	✓
Ground-to-Air Radio	1792	
GPS Receiver	M406167-00	
AWOS 3000 Software Installation CD	M595814-00-060	
UPS	20913-F	
UPS Batteries (3 required per UPS)	Minuteman 37000007	
SENSORS		
Wind Direction Sensor	2020	
Tail Vane	T802000	
Potentiometer/Shaft Assembly	T170522	
Bearing Kit	M488140	
Heater	20201	✓
Wind Speed Sensor	2030	
Cup Assembly	T800303	
Photon Chopper Assembly	T801600	
Bearing Kit	M488141	
Heater	20201	✓

Description	Model/Part No.	Option
Ultrasonic Wind Sensor (unheated)	2040	
RS-422 Converter	M438205-00	
Ultrasonic Wind Sensor (heated)	2040-H	
RS-422 Converter	M438205-00	
Fuse 4 A	M442105-00	
Ultrasonic Wind Sensor (high heat)	2040-HH	
RS-422 Converter	M438205-00	
Fuse 10 A	M442106-00	
Motor Aspirated Radiation Shield (MARS)	8190	
Fan	M444021	
Temperature Sensor/RH Sensor	5190	
Rain Gauge (unheated)	6011-A	
Rain Gauge (heated)	6021-A	
Visibility Sensor	8364-E	
Emitter Head Assembly	M105061-00	
Detector Head Assembly	M105060-00	
Controller Board	M404811	
AC Interface	M404802	
Firmware	M469058	
Fuse 10 A Slow Blow	M442071	
Fuse 5 A Slow Blow	M442070	
Fuse 2 A	M442046	
Fuse 4 A	M442048	
Fuse 0.5 A	M442057	
Ambient Light Sensor	M488171	
Day/Night Detector	M403326-00	
Cloud Height Sensor	8339-FAA	
Optical and Laser Module	M403434-01	
DAQ & Power PCB	M404848-02	
Blower, 110 V AC	83396-00	
Power Supply	M438200-00	
Communication Cable	M491742-00	
Fuse 5 x 20 mm, 5 A, 250 V AC	M442088-00	
Fuse 5 x 20 mm, 10 A, 250 V AC	M442089-00	
Desiccant	M028181-00	
Battery	83395-00	
Present Weather Sensor	6490	
AC Interface	M404802	
Fuse 5 A Slow Blow	M442070	
Fuse 10 A Slow Blow	M442071	
Heater Power Supply	M438158	
Sensor Interface Controller	M404806	
Present Weather Firmware EPROM	M469053	

Description	Model/Part No.	Option
Thunderstorm/Lightning Sensor	6500	
AC Interface	M404802	
Sensor Interface Controller	M404806	
Firmware	M469067	
Power Supply	M438152	
Fuse 5 A Slow Blow	M442070	
Fuse 10 A Slow Blow	M442071	
Freezing Rain Sensor	6495	
Communication Cable	M491740	
MISCELLANEOUS EQUIPMENT		
Printer	20910-A	
Printer Ribbon	20911	
UHF/VHF Antenna	M489103	✓

Monthly Procedures

AWOS monthly maintenance consists of a general system check and cleaning of sensor optics. Follow the procedures below, take any required corrective action, and record the results on the *Monthly Technical Performance Record*.

The person performing the monthly maintenance procedures is not required to have any FAA certification. However, the monthly maintenance should be performed by an individual who has attended the User and Maintenance training given by AWI and documented in the **AWOS 3000 Maintenance Training Course** (3000-044). This training will familiarize the person with the basic mechanical and electrical orientation needed to perform monthly maintenance.

2.1 Monthly Maintenance Tools and Supplies

The following list gives the tools and supplies required during monthly maintenance of the AWOS.

Description	Part/Model No.	Specifications
Assorted Hand Tools	n/a	n/a
Clean Dry Cloth	n/a	Lint free
Water & Spray Bottle	n/a	n/a
Lightweight Greaseless Oil	n/a	(e.g., 3-in-1 or equivalent)
isopropyl Alcohol	n/a	70%-100%
RTV sealant	RTV 162	n/a
Business Card	n/a	Business card, credit card, driver's license, one U.S. dollar or equivalent in weight and size.
Paint	n/a	White, outdoor enamel. Krylon and Rustoleum are two popular brands
Soap	n/a	Mild – non-scented. Ivory brand soap bars work well.
Sandpaper or Emery Cloth	n/a	120-150 grit suitable for removing surface rust or corrosion.

2.2 General Maintenance

Verify that obstruction lights on the tower are checked. This is generally the responsibility of the airport operator, but since airport personnel will likely be performing the remaining maintenance, it is reasonable that airport personnel confirm the operation of the obstruction lights. The overall condition of the sensor site, including weed heights, things that might interfere with a sensor's ability to perform properly, and the presence of items that may encroach on the siting criteria parameters should also be reviewed at this time.

Inspect all mounting hardware and external surfaces and cable assemblies.

If surfaces require cleaning, use mild soap and water. If surfaces are rusty, preserve them by sanding off the rust and applying paint.

If any cables have developed stress cracks or exhibit other damage that appears to compromise the integrity of the outer protective sheath, report the problem immediately – do not attempt to service any electrical cable.

2.3 Specific Maintenance

2.3.1 Model 1190 Data Collection Platform

1. Verify that all cables are connected and in good condition.
2. Press the maintenance switch (SW3).

2.3.2 Model 7190 Dual Digital Barometer

1. Visually check the pressure port and clear any debris from within the plate area.

2.3.3 Model 2020 Wind Direction Sensor

1. Visually verify that the vane is moving freely.
2. Verify that the displayed values on the DCP are not static. A small breeze will be necessary. (This is an indication that the internals of the sensors are working properly and are communicating their values to the DCP appropriately.)
3. Verify that the sensor is clear of large debris, such as bird nests.

2.3.4 Model 2030 Wind Speed Sensor

1. Visually verify that the cups are moving freely.
2. Verify that the displayed values on the DCP are not static. A small breeze will be necessary. (This is an indication that the internals of the sensors are working properly and are communicating their values to the DCP appropriately.)
3. Verify that the sensor is clear of large debris, such as bird nests.

2.3.5 Model 2040 Ultrasonic Wind Sensor

1. Verify that the displayed values on the DCP are not static. A small breeze will be necessary. (This is an indication that the internals of the sensors are working properly and are communicating their values to the DCP appropriately.)
2. Verify that the sensor is clear of large debris, such as bird nests.

2.3.6 Model 8190 MARS

Maintenance of the MARS is generally limited to periodic cleaning and occasional repainting of exterior surfaces.

1. Check the 8190 air inlet (the narrow end of the MARS) for obstructions and debris.
2. Remove obstructions and debris as necessary.
3. Check the MARS for insect activity (cobwebs, hornet's nests, etc.), as well as birds' nests, and clean out any debris.
4. The exterior surfaces of the MARS should be free of dirt at all times to prevent internal heating of the probe. Clean the surfaces regularly with water and mild soap. Repaint the exterior surfaces as required. Surfaces may be scuffed with sand paper to clean them and encourage better paint adhesion.
5. During regular maintenance, check the fan housing for signs of corrosion. Clean the housing and protective grate as necessary. Use only a damp cloth. Do not squirt water into the fan.
6. The inside of the enclosure may also need to be cleaned of excessive dirt drawn in by the fan. Use only a damp cloth. Do not use soap.
7. Check all cables for signs of wear or damage, especially in areas with high velocity winds. Check all mounting hardware for corrosion or looseness, and repair or replace as required. If any cables have developed stress cracks or exhibit other damage that appears to compromise the integrity of the outer protective sheath, report the problem immediately – do not attempt to service any electrical cable.
8. Check the fan for noise that could be a sign of worn bearings.
9. If the MARS fan is in need of repair, report the problem
10. Using a small light-weight object, such as a business card, credit card, driver's license or one dollar bill, test to ensure the MARS fan is producing adequate air flow. Place the business card over the small end of the MARS (the air inlet). The card should be held in place by the suction produced by the fan.
11. If the MARS fan is in need of repair, report the problem.

2.3.7 Model 6011 Rain Gauge

1. Remove the screen from the funnel of the rain gauge and gently tap the screen to free any dirt or debris.
2. Check the rain gauge funnel for insect activity (cobwebs, hornet's nests, etc.), as well as birds' nests, and clean out any debris. Be sure to check underneath the instrument as well.
3. Water and a damp cloth can be used to clean the rain gauge as needed. Do not use soap.
4. Never paint the rain gauge. If repairs are needed, report the problem.
5. Reinstall the screen.

2.3.8 Model 6021 Heated Rain and Snow Gauge

1. Remove the screen from the funnel of the rain gauge and gently tap the screen to free any dirt or debris.
2. Check the rain gauge funnel for insect activity (cobwebs, hornet's nests, etc.), as well as birds' nests, and clean out any debris. Be sure to check underneath the instrument as well.
3. Water and a damp cloth can be used to clean the rain gauge as needed. Do not use soap.
4. Never paint the rain gauge.
5. Reinstall the screen
6. If the ambient temperature is below 40°F, feel the rain gauge cover to check operation of the heaters. If they are working, the outer cover should be warm to the touch.
7. If repairs are needed, report the problem.

2.3.9 Model 8364-E Visibility Sensor

1. Clean the Visibility Sensor windows using a soft cloth and water.
2. Clean the Day/Night Sensor optics.

2.3.10 Model 8339 Ceilometer

CAUTION

Use clean water and a soft cloth to clean the windows. Commercial cleaners containing ammonia will degrade the optical coating on the windows, resulting in degraded sensitivity (higher altitude clouds will no longer be detected).

1. Clean the transceiver windows at least once per month (more frequently if local conditions warrant), or when the status message so indicates. Note that a dirty window warning message may also appear during rain, snow, and fog conditions, whenever the internal electronics measure a certain level of window opacity.
2. Each time the windows are cleaned, check blower operation by covering the receiver window, shown in Figure 1, with a diffuse reflective object (such as a sheet of white paper) and verifying that the blower turns on. This may take up to 30 seconds.



Figure 1. The right hand side is the receiver

2.3.11 Model 6490 Present Weather Sensor

1. With a clean finger, touch the lenses in front of the disc-shaped heaters which are bonded to the upper and lower inside surface of lenses. The lens surfaces should be slightly warmer to the touch than the ambient temperature.
2. If the lens is not warm to the touch, the sensor must be repaired or replaced.
3. Clean the lenses by first spraying water on the lens and then wiping gently with a lint-free cloth to prevent scratching the glass optics.

2.3.12 Model 6500 Thunderstorm/Lightning Sensor

1. Check the antenna for dents, cracks, or punctures.
2. Remove all dirt and grease from surface areas using a soft cloth moistened with mild soap and water.

2.3.13 Model 6495 Freezing Rain Sensor

WARNING

The freezing rain sensor probe assembly will be hot if the sensor recently completed a deice cycle. Ensure that the probe assembly has cooled before cleaning the probe. While in the deice mode, the probe will radiate a significant amount of heat. This can be observed by placing a hand close to, but not on, the sensor probe. Always avoid direct contact of the probe with skin to avoid a potential burn hazard.

CAUTION

Do not touch the probe with bare hands, as oil residue from skin will affect the performance of the sensor.

1. Visually inspect the surface of the probe for contaminants such as dirt, oil, fingerprints, etc.
2. If any contaminants are present, clean the probe using isopropyl alcohol and a soft cotton cloth.

2.3.14 Central Data Processor (CDP)

1. Check display operation.
2. Check keyboard operation.
3. Check printer operation as necessary. If the printer has been printing normally during the past hour, it is not necessary to perform this test.
4. Log in as an operator
5. Go to the **File > Printer Setup** menu
6. Click the “Print Test Page” button and verify that the test page was printed
7. Check the printer ribbon and replace as necessary.
8. Check the printer paper and replace as necessary.
9. Check microphone operation by recording a voice remark. Delete the remark when done. To delete a voice remark, record a short (approximately one second), empty remark over it, and set “enabled” to “off.”
10. Check dial-up telephone operation by dialing the CDP from an outside line.
11. Verify VHF radio operation by listening to the AWOS voice output over a remote receiver.
12. Check the system clock against a known standard. If the difference is greater than 10 seconds, report the problem.
13. Check speaker operation.
14. Check UPS operation by disconnecting the AWOS power cable. The AWOS should not shut down.

2.4 Record AWOS Observations

The final portion of the AWOS Monthly Technical Performance Record provides room to record AWOS readings and to note any irregularities. This provides a written snapshot in addition to the logs generated automatically.

- Time and Date
- Wind Direction
- Wind Speed
- Visibility
- Sky Condition (Clouds)
- Precipitation
- Present Weather
- Thunderstorm/Lightning
- Freezing Rain
- Temperature
- Dew Point
- Altimeter Setting
- Note any "missing" parameters or any other obvious failures

Triennial Procedures

AWOS triennial maintenance is performed three times per year. Follow the procedures below, take any required corrective action, and record the results on the *Triennial Technical Performance Record*.

Only an FAA authorized technician of record for the site may perform triennial procedures.

3.1 Triennial Maintenance Test Equipment

The following list gives the test equipment required during triennial maintenance of the AWOS. This is in addition to that required for monthly procedures.

Description	Part/Model No.	Specifications
Visibility Calibrator	M104744	
2 pieces of opaque black foam	n/a	Opaque black foam 1" to 4" inches thick., approximately 4" x 6"
Psychrometer*	Model 5211 (Sling), Model 5230 (Assmann) or equivalent	$\pm 0.67^{\circ} \text{ F}$ ($\pm 0.37^{\circ} \text{ C}$)
Psychrometric Calculator*	Model 5282-A or equivalent	$^{\circ} \text{ F}$
Digital Temp/RH Sensor*	Rotronics HC2-S3 or equivalent	$\pm 0.67^{\circ} \text{ F}$ ($\pm 0.37^{\circ} \text{ C}$), 1% RH
Reference Pressure Sensor	Z003919 or equivalent	$\pm 0.0067 \text{ in Hg}$ ($\pm 0.02\%$)
* Use either psychrometer & psychrometric calculator or Digital Temp/RH sensor.		

3.2 Triannual Maintenance Tools and Supplies

The following list gives the tools and supplies required during triannual maintenance of the AWOS. This is in addition to that required for monthly procedures.

Description	Part/Model No.	Specifications
Extension Cord	n/a	50', 16-3 or larger
Digital Voltmeter	n/a	4-1/2 digit
Scientific Calculator	Hewlett Packard HP-35, Texas Instruments TI-30 or equivalent	Basic scientific calculator capable of performing square-roots and exponent math – FX260, FX-300ES, EL-501, HP-10S, HP-11C, HP-15C, HP-32S, HP-35, TI-30, and TI-84 are all popular models
8339 Ceilometer Desiccant	M028181-00	

3.3 Perform Monthly Procedures

As part of triannual maintenance, perform the monthly maintenance procedures detailed in the previous chapter. Only those procedures unique to triannual maintenance are provided in this chapter.

3.4 Specific Triannual Maintenance

Constant vibration over time at certain sites such as oil platform sites may loosen the screws and bolts used to secure the sensors and controller boxes to mounting struts or poles. Check these screws and bolts as part of the triannual maintenance if the weather station is located at such a high-vibration location, and retighten them as necessary.

3.4.1 Model 1190 Data Collection Platform

1. Press the maintenance switch (SW3).
2. On the DCP display, navigate to the analog-to-digital reference voltage screen (“ADC Vref-” and “ADC Vref+”).
 - Verify that ADC Vref- is in the range 0–5.
 - Verify that ADC Vref+ is in the range 4090–4095.

3.4.2 Model 7190 Dual Digital Barometer

The Model 7190 barometer is located in the top-right corner of the DCP.

1. Remove the quad plate pressure port drain plug (the Phillips screw on the underside of the bottom plate) using a Phillips screwdriver, and drain any accumulated moisture.
2. Remove both flexible tubes from the barometer inlets and blow gently into the tubes to clear any accumulated debris.
3. Replace the tubes and drain plug.

When performing the pressure check below, the reference pressure sensor (Z002919 or equivalent) should be lifted up until it is at the same level as the 7190. If the wind is blowing, the reference sensor may deliver different readings, depending on which way it is facing and where it is located. The quad-plate pressure port on the bottom of the DCP enclosure minimizes the effect of wind on the 7190 pressure reading. If the reference sensor does not have a similar wind compensation port, you may not be able to get accurate readings on windy days.

4. Compare the output of the reference sensor to that of the 7190. The value of the sensors in the 7190 may differ from one another by up to 0.02 in Hg and still be within tolerance. Sensors used in AWOS systems must be adjusted, as necessary, to within ± 0.005 in Hg of the reference sensor. Adjustments of more than 0.05 in Hg are not allowed. If either of the sensors in the 7190 differs from the reference sensor by more than 0.05 in Hg, replace the sensor.
5. Note the amount of deviation of each of the sensors in the 7190 from the reference; these will be used as the adjustment values.
6. At the CDP, insert the CD Key into the optical drive. Go to the *Edit > Configuration* menu, then to the *Airport > General* tab.
7. Enter the adjustment values in the **BP Offset** field. An offset will be “negative” if the sensor reading is greater than the reference pressure standard.
8. Remove the CD Key from the optical drive at the CDP.

3.4.3 Model 2020 Wind Direction Sensor

No additional procedures.

3.4.4 Model 2030 Wind Speed Sensor

No additional procedures.

3.4.5 Model 2040 Ultrasonic Wind Sensor

No additional procedures.

3.4.6 Model 5190 Temperature/Relative Humidity Sensor

Triannual maintenance of the Model 5190 Temperature/Relative Humidity Sensor consists of performing the monthly maintenance tasks, cleaning the dust filter, and checking the accuracy of the 5190 against readings made using a reference sensor or psychrometer, as explained below.

While performing the accuracy check, keep these provisions in mind.

- For both temperature and dew point, it is important that the reference sensor be subject to the same conditions as the Model 5190. If the reference sensor is in the sun, near your body, or downwind from you, it is greatly affected. This will result in the reference sensor and the 5190 delivering very different results. Even if the reference sensor is removed from direct sun, reflected light (from snow or sand, for example) can affect the measurements.
- On cloudy, breezy days, there is usually no problem getting good reference readings. You only need to be sure to stay downwind of the MARS and the reference sensor.
- On sunny or calm days, it is often necessary to place the sensing element of the reference sensor inside the MARS intake. This ensures that both sensors are sampling the same air conditions. The reference sensor can be held in place in the MARS intake using a bungee cord, wire, string, or tape. The reference sensor should not touch the sides of the MARS tube or the 5190. The reference sensor must not block the MARS airflow.
- The reference sensor can take up to ten minutes to stabilize, as the sensor body may have absorbed or lost heat from contact with your body or from storage conditions. As you observe the readings, the two sensors may start out several degrees apart, but will slowly approach each other. Do not take any official reading until after the temperatures have settled.
- Differences in response time between the two sensors can also make field temperature comparisons difficult. As wind changes direction, it can change humidity and temperature. One sensor will always react faster than the other. Taking measurements in changing conditions is not recommended.
- Use of a sling psychrometer as a field reference sensor is strongly discouraged for anyone except an experienced meteorologist. Electronic temperature/relative humidity sensors and motor aspirated sensors are recommended for field use.

Triannual Model 5190 Temperature/Relative Humidity Sensor Procedures

1. Position the reference sensor as described above. Allow a minimum of 20 minutes for the sensor to stabilize before proceeding.
2. Record the temperature and dew point temperatures from both the reference sensor and the AWOS at 1 minute intervals for 5 minutes (5 readings).

3. Compare the reference sensor temperature reading to the AWOS reading in each set. At least three sets must have readings within $\pm 1^{\circ}\text{F}$ ($\pm 0.56^{\circ}\text{C}$) of one another. If fewer than three sets are within this range, take a second round of readings (5 readings at 1-minute intervals). If this second round fails to yield at least three sets of readings within $\pm 1^{\circ}\text{F}$ ($\pm 0.56^{\circ}\text{C}$) of one another, the sensor must be replaced.
4. For each set of readings meeting the above requirement, subtract to find the difference between the two temperatures and square the result.
5. Take the average of the square root of the average of the squared results obtained in the previous step. If the result is within $\pm 2^{\circ}\text{F}$ ($\pm 1.1^{\circ}\text{C}$), the sensor passes. Otherwise, the sensor must be replaced.
6. Compare the reference sensor dew point reading to the AWOS reading in each set. At least three sets must have readings within $\pm 0.5^{\circ}\text{F}$ ($\pm 0.28^{\circ}\text{C}$) of one another. If fewer than three sets are within this range, take a second round of readings (5 readings at 1-minute intervals). If this second round fails to yield at least three sets of readings within $\pm 0.5^{\circ}\text{F}$ ($\pm 0.28^{\circ}\text{C}$) of one another, the sensor must be replaced.
7. For each set of readings meeting the above requirement, subtract to find the difference between the two dew point values and square the result.
8. Take the average of the square root of the average of the squared results obtained in the previous step. If the result is within $\pm 3^{\circ}\text{F}$ ($\pm 1.7^{\circ}\text{C}$), the sensor passes. Otherwise, the sensor must be replaced.

3.4.7 Model 8190 MARS

1. Remove the MARS fan fuse (F1) at the DCP and verify that the DCP indicates a fan failure.
2. Replace fuse F1.

3.4.8 Model 6011 Rain Gauge

No additional procedures.

3.4.9 Model 6021 Heated Rain and Snow Gauge

No additional procedures.

3.4.10 Model 8364-E Visibility Sensor

The Visibility Sensor is calibrated during triannual maintenance. This must be performed when there is at least 7 miles visibility with calm wind conditions. The calibration paddle is traceable to Air Force Geophysics Laboratory reference transmissometers. Equivalent extinction coefficient values are printed on each paddle.

1. If the sun is shining directly or is being reflected into the emitters or detectors, note the original orientation of the Visibility Sensor, then loosen the crossmember mounting bolt and rotate the entire head assembly so that no direct or reflected sun shines into the emitters or detectors.
2. Press the # key on the DCP keypad repeatedly until the 8364-E calibration screen appears.

Note: If more than a few minutes have elapsed since the maintenance switch was originally pressed, it may be necessary to press it again to enable access to the visibility calibration screens.

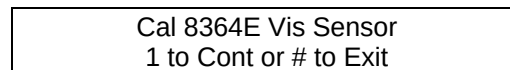


Figure 2. Visibility Calibration Screen

3. Enter the Cal I.D. # shown on the calibration paddle label.
4. A routine will be executed by the visibility controller to ensure proper operation prior to calibration measurements. You will be prompted to perform routine maintenance, such as removal of obstructions in the optical paths and cleaning of the sensor windows, during this routine. While you are performing the requested maintenance, the sensor will operate alternately in both modes to keep the optical emitters at thermal equilibrium. When you press a key to continue, as prompted, the controller may take up to one minute to respond. The sensor will then begin its calibration measurements.
5. The initial measurement takes five minutes. When the five minute interval is complete, you will be prompted to insert the calibration paddle.
6. Insert the calibration paddle. Hit the # key to continue.
7. After a second five minute measurement interval, you will be prompted to remove the calibration paddle and block the emitters ("COVER EMS").
8. Remove the calibration paddle at this point and insert a piece of black foam over each emitter opening so that no emitted radiation will reach the detectors. Press the # key to continue.

Note: If the emitters cannot be completely covered, the calibration procedure will not be able to reliably get within the required 3% accuracy. If this happens, the emitters may be disconnected at the controller instead of being covered. The emitters should be left disconnected until after the test is complete, at which time the Visibility Sensor should be turned off, the emitters reconnected, and the Visibility Sensor turned back on. It is safe to disconnect the emitters with power applied.

9. Following a further set of measurements, a new set of calibration coefficients are generated for the sensor. The new coefficients are stored in a protected EEPROM. This calibration method requires no fine adjustment of analog circuitry, nor opening of the emitter or detector heads.

10. Upon completion of the measurement cycle, the display will show the old and new calibration values. You will be given the option to accept or reject the new value. Press the # key to accept it. The value should only be rejected if the technician believes the value is bad due to a problem during calibration (the foam block falls from the emitter, for example).
11. If the difference between the old and new values is more than 3%, you must repeat the calibration process until the difference is less than 3%. In normal operation, when the sensor is calibrated on a regular basis (every 3–4 months), the calibration difference will rarely exceed 3%. If a long period has elapsed since the last calibration, the difference may exceed 3%. This is normal.
12. Record the old and new calibration values in an ongoing log for future reference.
13. Once the calibration value has been accepted, the visibility controller will return to normal measurement mode using the newly calculated calibration values.
14. If the calibration procedure is not followed correctly or there is a fault with the sensor, the calibration process will abort and the Visibility Sensor will return to normal operation. If this should happen, follow the troubleshooting procedures in the ***Model 8364-E User's Manual*** should be followed to isolate the problem.
15. Once the Visibility Sensor has been operating for 10 minutes, verify there are no improper status errors reported at the DCP.
16. Verify that the entire head assembly and crossarm are back to the original position noted in Step 1, and then tighten the crossmember mounting bolt in the base of the crossmember so that it does not rotate.

If a Day/Night sensor is installed, check its operation as follows.

1. During daytime, set the DCP's LCD display to show Day/Night status.
2. Verify that the display shows the sensor is reading "day."
3. Cover the lens with a black bag. Within 3–5 minutes, the output should switch to the "night" state.
4. Uncover the lens, and verify that the output switches back to the "day" state.

3.4.11 Model 8339 Ceilometer

1. Clear the Heater/Blower air intake and output nozzle of any impediments, such as spider webs, leaves, or other matter.
2. Check the status LEDs visible from outside the Ceilometer through the transmitter window.



- The red System Status LED alternates between on and fast blinking when the Ceilometer is operating normally.
 - The green Battery Status LED is on when the DC power (battery) is good.
 - The yellow Dirty Window LED is off when the window is clean.
3. Replace the desiccant package at each triannual maintenance visit. If the enclosure door is opened during maintenance or service at any time, replace the desiccant package (M028179-00) before closing the door for the final time. To preserve the desiccant material, the package is sealed within a plastic bag during shipment. Remove and discard the plastic bag.

3.4.12 Model 6490 Present Weather Sensor

1. Check the strength of the carrier signal by displaying the present weather status screen on the DCP display (press the * or # keys until the screen below is displayed).

XnnnLnnnKnnnHnnnTnnn

2. The carrier raw data field (Xnnn) should be in the range of 405–420. If it needs to be adjusted, refer to the Model 6490 User's Manual.

The remaining tests should be performed when there is no precipitation and after the sensor has stabilized for at least 30 minutes.

3. The following values should be observed on the status screen.

- Lnnn - The one-minute low channel reading should read in the range of -30 to 50.
- Knnn - The one-minute particle channel reading should read in the range of 0 to 150.
- Hnnn - The one-minute high channel reading should read in the range of 40 to 120.
- Tnnn - Temperature should be representative of the ambient temperature, with a tolerance of $\pm 5^{\circ}\text{C}$. The temperature probe is thermally connected to the electronics enclosure, so it generally reads warmer than the ambient temperature because of internal heating of the enclosure.

If any of the values is outside the allowed range, report the problem.

4. Display the present weather data screen on the DCP display using the * and # keys.

- The present weather field (W___) should not contain any data (two underscores) if there is no precipitation falling. As long as there is no precipitation falling and the present weather field displays anything other than two underscores, report the problem.
- The status fields should all read zeros (S0000) if the sensor has been operating (and not reset by a power interruption) for at least 5 minutes. If the status fields are not all zeros, refer to the ***Model 6490 User's Manual*** for an interpretation of the possible problem.

3.4.13 Model 6500 Thunderstorm/Lightning Sensor

1. Check the sealant around the antenna base and mounting bolts, and reapply as necessary (use RTV 162).
2. Check all hardware for corrosion and ensure that all bolts and connectors are tight.
3. Ensure that the cable connections are sound between the sensor and DCP.

3.4.14 Model 6495 Freezing Rain Sensor

No additional procedures.

3.4.15 Central Data Processor (CDP)

No additional procedures.

Annual System Revalidation

Annual system revalidation is carried out yearly. These procedures are also required at commissioning and after major repair work— replacement of a sensor or any part of a sensor, or adjustment of any part of the sensor circuit (e.g., adjusting the carrier level on the present weather sensor). Follow the procedures below, take any required corrective action, and record the results on the *Annual Technical Performance Record*.

Only an FAA authorized technician of record for the site may perform the annual system revalidation procedures.

4.1 Annual Revalidation Test Equipment

The following list gives the test equipment required during annual revalidation of the AWOS. This is in addition to that required for monthly and triannual procedures.

Description	Part/Model No.	Specifications
Wind Direction Calibrator	Model 1249-A	For Model 2020 vane
Wind Speed Calibrator	Model 1231	for Model 2030 anemometer
Integrity Check Chamber	M105548-00	for 2040 Ultrasonic Wind Sensor
Radio Test Equipment:		
Power Meter	Bird Watt Meter Model 43 or equivalent	
Forward/Reflected Power Tester	Bird Watt Meter Model 43 w/ 10C (VHF) and 5D (UHF) elements or equivalent	
Frequency Meter	Aeroflex 3500 or equivalent	
Modulation Meter	Aeroflex 3500 or equivalent	
Deviation Meter	Aeroflex 3500 or equivalent	

4.2 Annual Revalidation Tools and Supplies

The following list gives the tools and supplies required during annual revalidation of the AWOS. This is in addition to that required for monthly and triannual procedures.

Description	Part/Model No.	Specifications
Allen Wrench	n/a	1/16"
Scientific Calculator or Software	Hewlett Packard HP-35, Texas Instruments TI-30 or equivalent; Microsoft Calculator, Excel or equivalent	Basic scientific calculator or software capable of performing square-roots and exponent math
Non-corrosive Lubricant	Loctite Silver Grade anti-seize compound or equivalent	
Corrosion Protection Coating	M402010-00 corrosion block spray or equivalent	

4.3 Perform Monthly and Triannual Procedures

As part of annual maintenance, perform the monthly and triannual maintenance procedures detailed in the previous chapters. Only those procedures unique to annual maintenance are provided in this chapter.

4.4 Specific Annual Maintenance

4.4.1 Model 1190 Data Collection Platform

1. Press the maintenance switch (SW3).

4.4.2 Model 7190 Dual Digital Barometer

1. Using the barometric pressure value obtained with the reference pressure sensor during triannual maintenance, calculate the Altimeter Setting using the formula below:

$$\text{Alt. Setting (in Hg)} = \left(BP^{\alpha} + SE \cdot 1.313 \times 10^{-5} \right)^{5.25486}$$

where :

$$\alpha = 0.1903$$

SE = Sensor elevation above sea level in feet

BP = Barometric pressure in in Hg

2. Record the calculated altimeter setting and that reported by the AWOS.
3. If the difference between the calculated altimeter setting and that reported by the AWOS is more than 0.01 in Hg, please advise AWI Customer Service at 1(916)928-1000.

4.4.3 Model 2020 Wind Direction Sensor

1. Remove the sensor from the mounting bracket by loosening the clamp screw located at the base of the unit. Leave the sensor cable and, if present, the heater cable connected. These cables will ensure that, if the sensor is dropped, the device will not fall.
2. Clean the drain hole on the bottom of the sensor to ensure that debris does not prevent water from draining out of the sensor.
3. Spread non-corrosive lubricant on the clamp screw and reinstall the sensor. The sensor mounting hole should be aligned with the pin on the base of the mounting bracket.

4.4.3.1 Alignment

The Model 1249-A Wind Direction Calibrator is required when aligning the sensor on both the stationary or foldover tower types.

1. Locate the direction benchmark determined in the initial site survey. It should be approximately 100 to 150 feet from the tower in one of the four cardinal points referenced to true north. Align the sensor using the procedure below for either the stationary or foldover tower. When the sensor is installed on a foldover tower, it will be necessary to raise and lower the tower several times during alignment.
2. Separate the two halves of the Model 1249-A Wind Direction Calibrator by pulling the two discs apart.
3. Slip the bottom half of the calibrator (containing the knurled knob) onto the stationary portion of the vane's housing near the rotating cap. Loosen the knob, if necessary, to do this; then tighten the knob until the unit is secured.
4. Hold the vane's tail shaft and place the top half of the calibrator onto the shaft and sensor cap. Notice that the top half is recessed to accommodate the counter weight, and that there is a groove for the tail shaft and a cutout for the top of the vane cap.
5. Rotate the top plate until the four pins are aligned with the holes in the bottom plate. The bottom half of the calibrator may require adjusting if it is too high or too low on the vane housing. Loosen the knurled knob and position the bottom half as needed.

Note that the next steps for aligning a sensor require two people when the sensor is on a stationary tower—one person on the ground to observe the DCP's LCD display, and the other on the tower.

6. While observing the LCD display inside the DCP, loosen the knurled knob slightly and rotate the entire calibration unit (along with the sensor tail) until the DCP indicates 180°. (If the benchmark is located at East or West, rather than North or South, rotate the vane until the display reads 90 or 270.) Securely tighten the knurled knob to hold the vane in this position.

7. With the sensor locked in position, stand at the direction benchmark and verify that the tail of the vane is aligned with the vane body. If the vane is not aligned, loosen the mounting screw located at the bottom of the Unistrut, align the sensor (and base) with the benchmark, and tighten the mounting bolt.
8. Lift the top half of the calibrator and rotate it and the vane tail 90° to the next position. Verify that the DCP display agrees with the new direction. Continue rotating the sensor to each of the remaining cardinal directions and verify that the vane position and DCP display agree.

If the DCP display does not match the vane position, replace the Model 2020 Wind Direction Sensor.

9. Remove the calibrator.
10. Rotate the vane slowly through a full 360°, noting the reading on the LCD display (if on a foldover tower, the tower can be in the lowered position during this procedure). As the vane is turned, the displayed values should change smoothly, with no sudden jumps or dropouts. Note, however, that there is a 10° deadband at North where the DCP reading shows a steady value of 359°–001° in the 355°–005° deadband. This behavior is normal near North, but in any other direction indicates a potentiometer failure. If the sensor fails any part of this test, report the problem.
11. Verify that the vane's movement is free and smooth. If it is not, replace the bearings. The shaft should turn freely at all times.
12. Inspect all mounting hardware and cable assemblies for wear and damage. Replace as necessary.
13. Apply corrosion protection coating to the connector shell after the connector is attached and in place. Use a non-corrosive lubricant on all screws and fasteners whenever disassembly is required. The use of these lubricants will make future servicing easier.
14. If heaters are installed, verify they are working by holding your hand close to the heater. The heater is always on, and should be warm.

4.4.4 Model 2030 Wind Speed Sensor

1. Remove the anemometer cup assembly by loosening the two set screws on the cup assembly collar using a 1/16" Allen wrench.
2. Connect a Model 1231 run-up motor to the anemometer shaft and power the motor on. The DCP display should read between 79 and 81 knots.
3. Spin the shaft as fast as you can, using your thumb and middle finger. If the bearings are good, the shaft will spin for a minimum of 30 seconds. If the bearings feel rough or fail to spin for the 30-seconds, replace the bearings as described in the ***Model 2030 Sensor User's Manual***.
4. Replace the cup assembly.
5. Inspect the anemometer cups for damage, and replace if necessary.
6. Remove the sensor from the mounting bracket by loosening the clamp screw located at the base of the unit. Leave the sensor cable and, if present, the heater cable connected. These cables will ensure that, if the sensor is dropped, the device will not fall.
7. Clean the drain hole on the bottom of the sensor to ensure that debris does not prevent water from draining out of the sensor.
8. Use an anti-seize thread compound on the clamp screw and reinstall the sensor. The sensor mounting hole should be aligned with the pin on the base of the mounting bracket.
9. Inspect all mounting hardware and cable assemblies for wear and damage. Replace as necessary.
10. Apply corrosion protection coating to the connector shell with the connector attached and in place. Use a non-corrosive lubricant such as bee wax on all screws and fasteners. The use of these lubricants will make future servicing easier.
11. If heaters are installed, verify they are working by holding your hand close to the heater. The heater is always on, and should be warm.

4.4.5 Model 2040 Ultrasonic Wind Sensor

During annual maintenance, perform a Field Zero Wind Check as described below.

1. Install the Integrity Check Chamber (ICC) by inserting the reflector cases and the two halves of the ICC onto the Model 2040. The ICC must be retained using the strips provided.
2. View the wind speed value displayed at the DCP. The value must not exceed 0 knots. If the wind speed exceeds 0 knots, report the problem.
3. The sensor's alignment mark (the blue/white divide on the serial number label) must be aligned with the direction benchmark. Visually check the sensor's alignment by either
 - sighting along the sensor arms from the tower and verifying that the arms align with the benchmark, or
 - have an assistant stand at the marker and check that the arms align with the benchmark.
4. If the alignment needs to be adjusted, loosen the sensor mount and turn the entire sensor until the arms are aligned exactly with the benchmark, then tighten the mount.

4.4.6 Model 5190 Temperature/Relative Humidity Sensor

No additional procedures.

4.4.7 Model 8190 MARS

No additional procedures.

4.4.8 Model 6021 Heated Rain and Snow Gauge

1. Place your hand close to the outlet orifices to detect whether heat is emanating from the two orifice heaters. If the outlets are warm, then the heater system is powered up.
2. Remove the outer cover by removing two 1/4" bolts. Unplug the 3-conductor Molex connector (P1) from the power distribution housing (J1) in order to completely separate the outer cover from the base.
3. Check the sensor level using the bubble level provided on the base. Adjust if necessary.
4. Inspect the interior of the gauge for physical lightning damage.
5. Remove any dirt or debris that may be present inside the sensor.
6. Note the precipitation quantity on the DCP's LCD display. Toggle the bucket assembly one cycle (2 tips). Again read the precipitation quantity on the LCD display. It must be 2 counts greater than before.

If this count incrementation does not happen as described, examine the tipping bucket assembly, the counter, and the sensor cable connections between the sensor and the DCP.

7. Plug the 3-conductor Molex connector (P1) into the power distribution housing (J1). Replace the outer cover and bolts, coating the bolts with anti-seize compound. Replace the screen.

4.4.9 Model 8364-E Visibility Sensor

No additional procedures.

4.4.10 Model 8339 Ceilometer

No additional procedures.

4.4.11 Model 6490 Present Weather Sensor

No additional procedures.

4.4.12 Model 6500 Thunderstorm/Lightning Sensor

No additional procedures.

4.4.13 Model 6495 Freezing Rain Sensor

No additional procedures.

4.4.14 Radio Annual Revalidation

When VHF antenna cables are longer than 50 feet, tests must be repeated at the antenna end of the cable. UHF radio tests at the radio end are sufficient regardless of the length of the antenna cable.

4.4.14.1 Model 1792 Ground-to-Air VHF Radio

Power Level

1. Remove AC power from the radio by turning the power switch on the radio's front panel off.
2. Connect the power meter to the connector on the radio and terminate with the antenna or a dummy load.
3. Indicate the VHF radio output power level on the Annual Technical Performance Record.

VSWR (at transmitter)

If RF cables must be disconnected when switching between power level and VSWR tests, turn the radio off using the switch on the radio's front panel.

1. Insert a VSWR or forward/reflected power tester.
2. Measure the VSWR and enter the value on the Annual Technical Performance Record. If you measure forward and reflected power, calculate the VSWR using the following equation.

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}{1 - \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}$$

Sample Calculation:

Reflected power = 0.02 W

Forward power = 2.5 W

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}}{1 - \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}} = \frac{1 + \sqrt{\frac{0.02}{2.5}}}{1 - \sqrt{\frac{0.02}{2.5}}} = \frac{1 + \sqrt{0.008}}{1 - \sqrt{0.008}} = \frac{1 + 0.0894}{1 - 0.0894} = \frac{1.0894}{0.9106} = 1.1964$$

Frequency

CAUTION



Use isolators or attenuators as needed to protect the test equipment.

If RF cables must be disconnected when switching between frequency and modulation tests, turn the radio off using the switch on the radio's front panel.

1. Log the assigned frequency on the Annual Technical Performance Record.
2. Insert a frequency meter.
3. The radio transmits for approximately 30 seconds, followed by an off time of five seconds. While the radio is transmitting, measure the frequency.
4. Record the frequency on the Annual Technical Performance Record.

Modulation

CAUTION

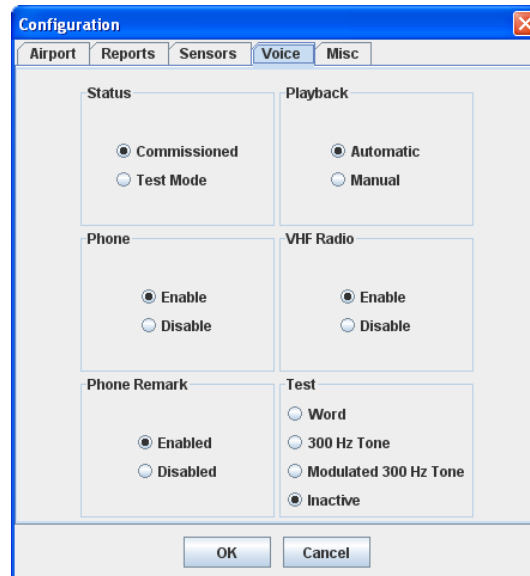


Use isolators or attenuators as needed to protect the test equipment.

If RF cables must be disconnected when switching between frequency and modulation tests, turn the radio off using the switch on the radio's front panel.

1. Log in as an administrator on the CDP display and insert a AWOS Security Key CD. You will be able to access the menus once the optical drive light stops blinking, indicating that the AWOS Security Key CD has been read.
2. Connect a modulation meter to the VHF radio. Set the modulation meter to the instantaneous mode.

3. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **300 Hz tone** option in the **Test** panel.



4. Use the modulation adjustment potentiometer on the VHF radio to adjust the modulation depth to 90%.

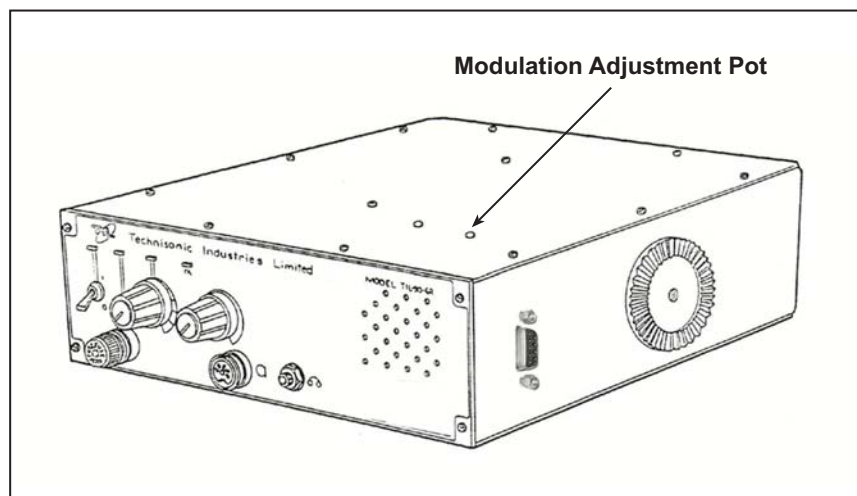


Figure 3. VHF Radio Modulation Adjustment Potentiometer

5. Use the VHF adjustment potentiometer on the CDP peripheral interface board to lower the signal level until the modulation decreases to 80%.

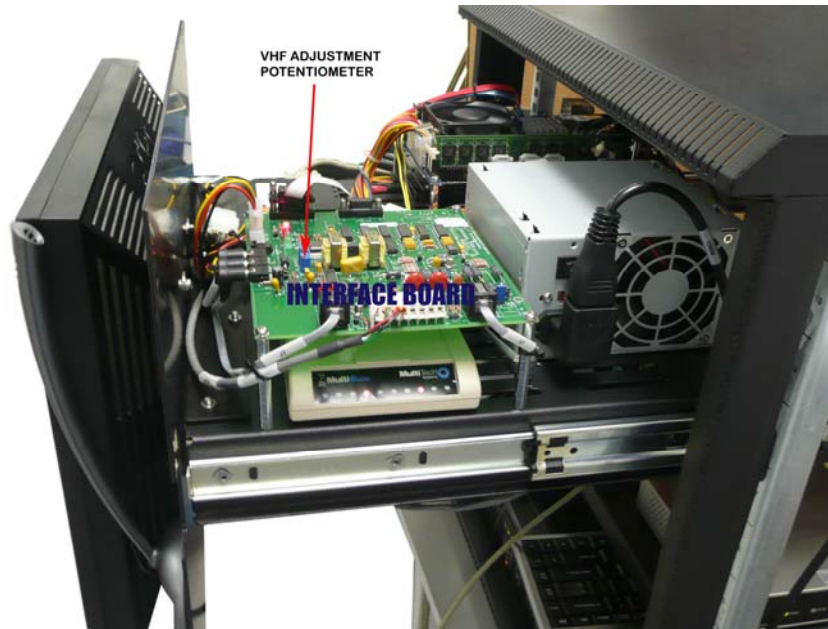


Figure 4. VHF Adjustment Potentiometer on CDP Peripheral Interface Board

6. Use the modulation adjustment potentiometer on the VHF radio to adjust the modulation depth to 60%.
7. Set the modulation meter to the “peak hold” mode.
8. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **Modulated 300 Hz tone** option in the **Test** panel.
9. Reset the modulation meter and wait until the modulated tone stops.
10. Verify that the peak modulation reading does not exceed 95%. If it does, adjust the modulation adjustment potentiometer on the VHF radio and recheck the peak modulation reading.
11. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **Word** option in the **Test** panel.
12. Reset the modulation meter and wait until the words stop. Verify that the peak modulation reading does not exceed 95%. If it does, adjust the modulation adjustment potentiometer on the VHF radio and recheck the peak modulation reading.
13. Enter the final modulation meter reading on the Annual Technical Performance Record.
14. Turn the radio off using the front panel switch. Disconnect the test equipment and cables, and reconnect the antenna. Turn the radio on.
15. Remove the CD Key from the CDP optical drive.

4.4.14.2 Model 20980-A UHF Data Link Radio

Perform the following procedures on both the DCP and CDP UHF radios.

Power Level

1. Remove power from the UHF radio by disconnecting the DB9 connector.
2. Connect a power meter to the radio connector and terminate with the antenna or a dummy load.
3. Reconnect the DB9 connector to restore power to the UHF radio.
4. Measure the forward power on the power meter and record on the Annual Technical Performance Record.

VSWR (at transmitter)

If RF cables must be disconnected when switching between power level and VSWR tests, remove power from the radio by disconnecting the DB9 connector.

1. Insert a VSWR or forward/reflected power tester.
2. Measure the VSWR and enter the value on the Annual Technical Performance Record. If you measure forward and reflected power, calculate the VSWR using the following equation.

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}{1 - \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}$$

Sample Calculation:

Reflected power = 0.02 W

Forward power = 1 W

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}}{1 - \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}} = \frac{1 + \sqrt{\frac{0.02}{1}}}{1 - \sqrt{\frac{0.02}{1}}} = \frac{1 + \sqrt{0.02}}{1 - \sqrt{0.02}} = \frac{1 + 0.1414}{1 - 0.1414} = \frac{1.1414}{0.8586} = 1.3293$$

Frequency

CAUTION



Use isolators or attenuators as needed to protect the test equipment.

If RF cables must be disconnected when switching between VSWR and frequency tests, remove power from the radio by disconnecting the DB9 connector.

1. Log the assigned frequency on the Annual Technical Performance Record.
2. Insert a frequency meter.
3. Measure and log the frequency on the Annual Technical Performance Record.

Deviation

CAUTION



Use isolators or attenuators as needed to protect the test equipment.

If RF cables must be disconnected when switching between VSWR and frequency tests, remove power from the radio by disconnecting the DB9 connector.

1. Insert a deviation meter.
2. Enter the meter reading on the Annual Technical Performance Record.
3. Remove AC power from the radio, disconnect the test equipment and cables, reconnect the antenna, and restore AC power.

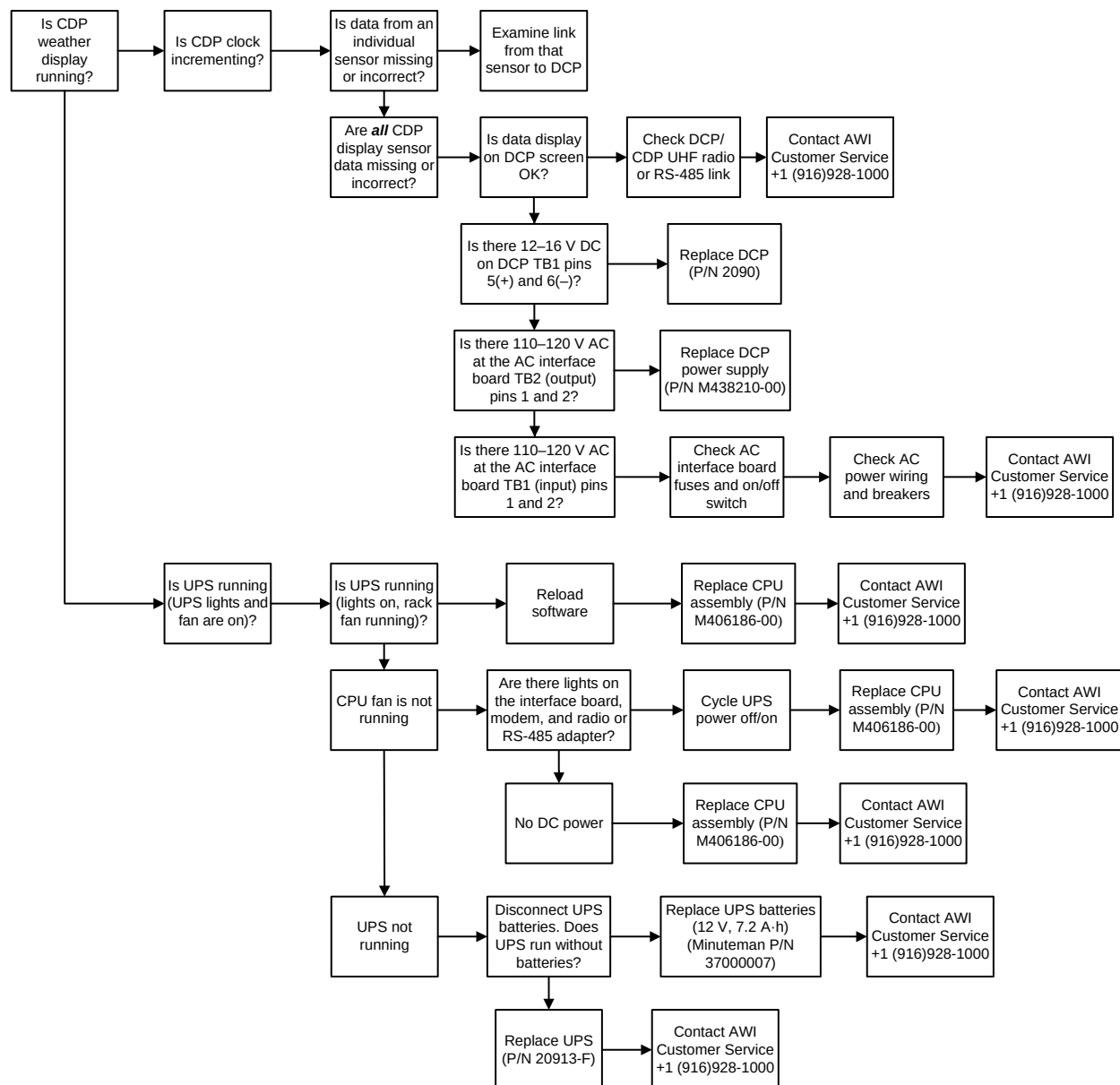
4.4.15 Central Data Processor (CDP)

1. Verify that no active alarms are present.
2. If active alarms are present, delete the alarms (after performing all annual procedures) and verify that the alarms do not recur. If alarms persist, report the problem to the Airport Manager.

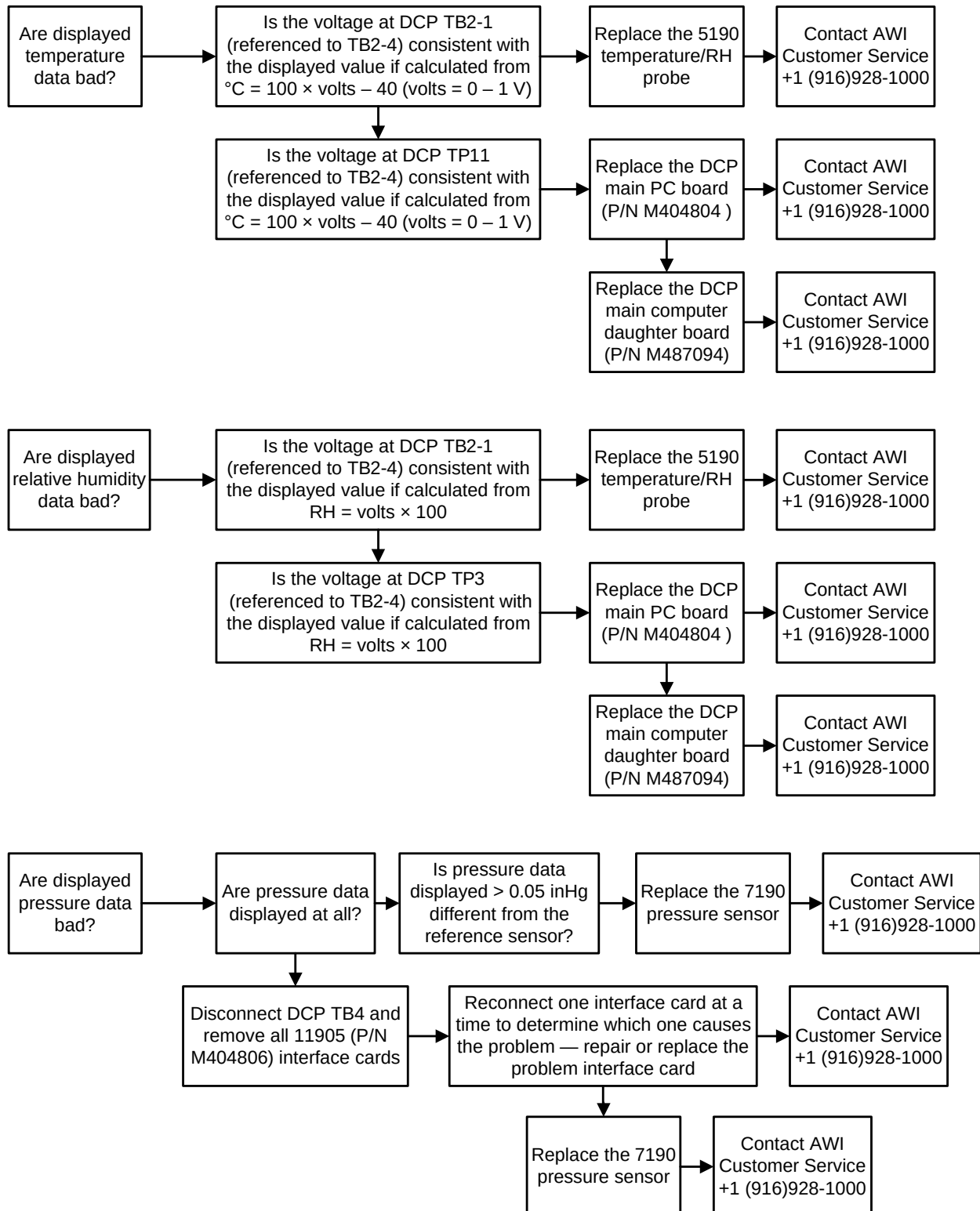
Troubleshooting Guide

The following pages provide troubleshooting steps for the various AWOS 3000 sensors and major system components.

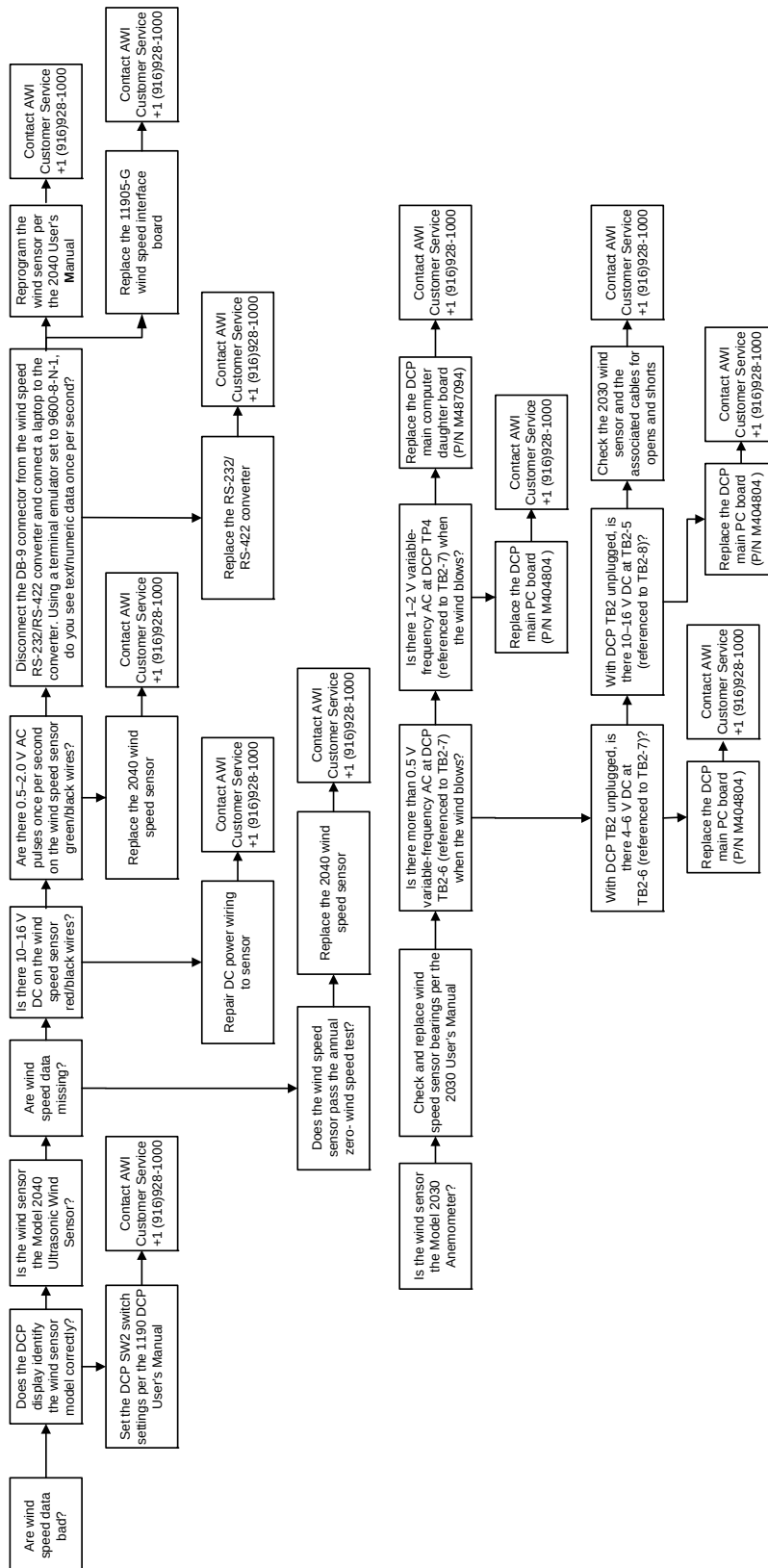
5.1 Central Data Processor (CDP)



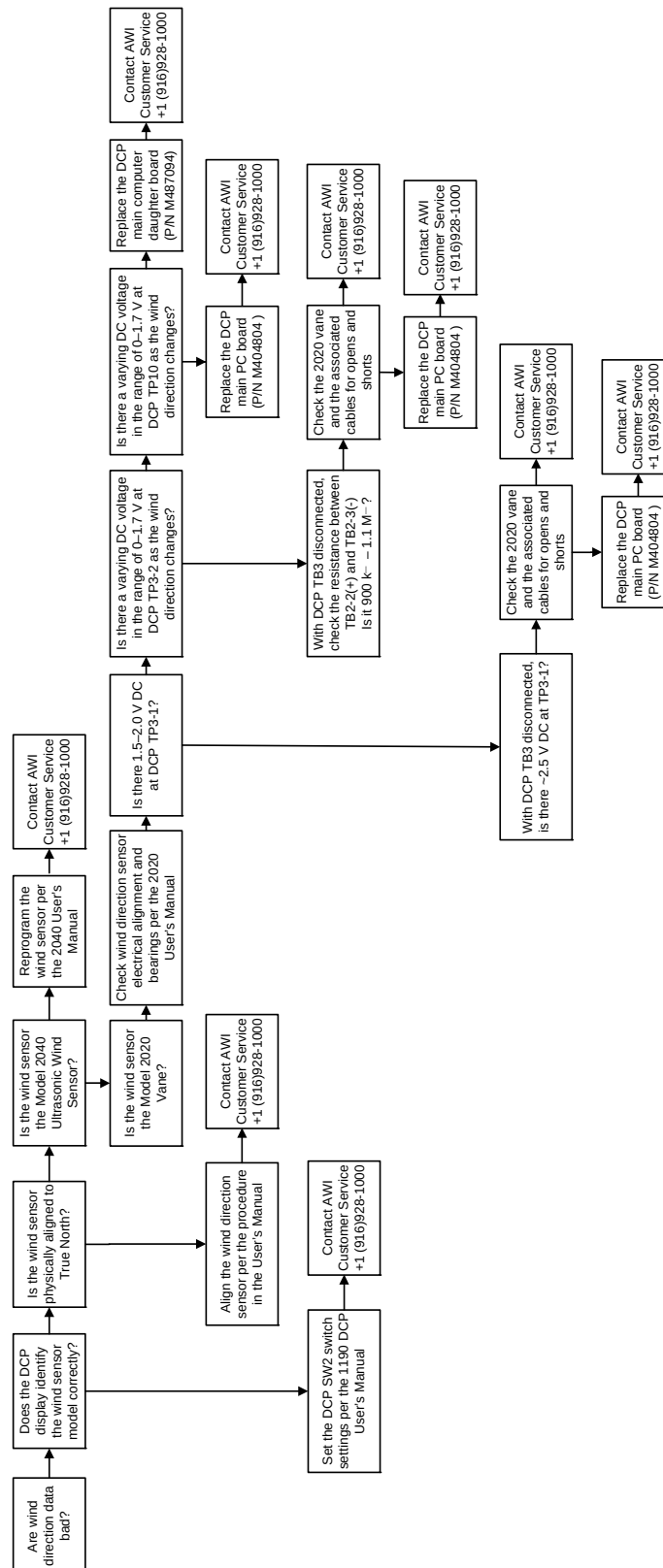
5.2 Temperature/Relative Humidity/Barometric Pressure Sensors



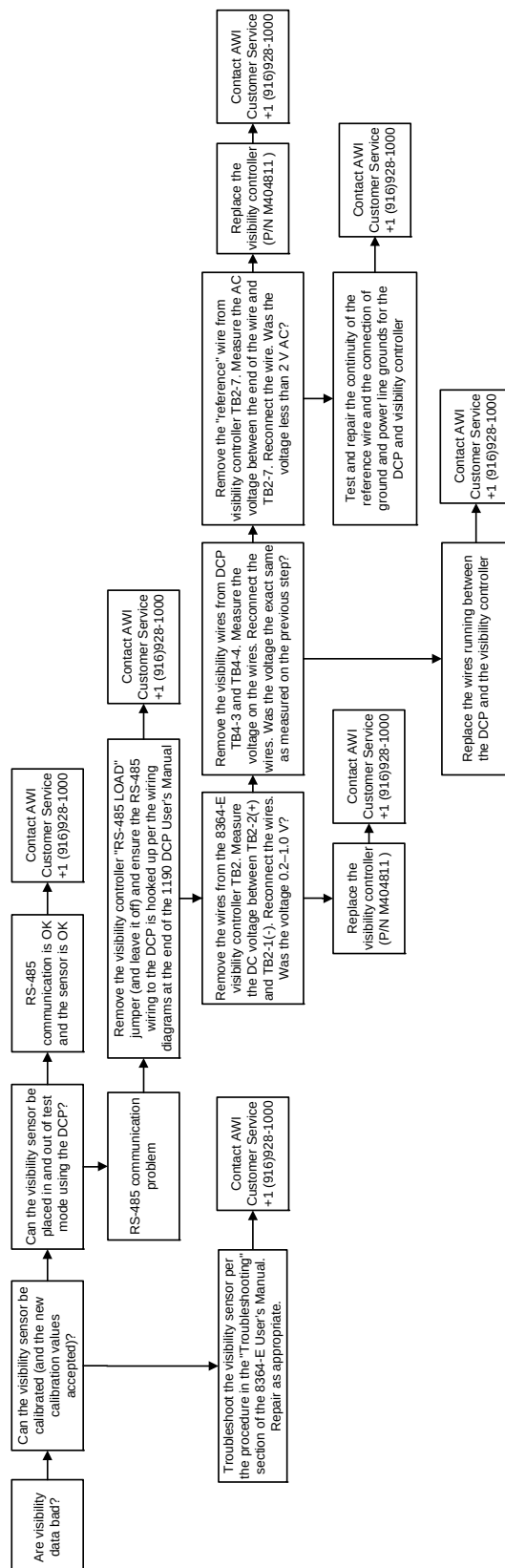
5.3 Wind Speed Sensors



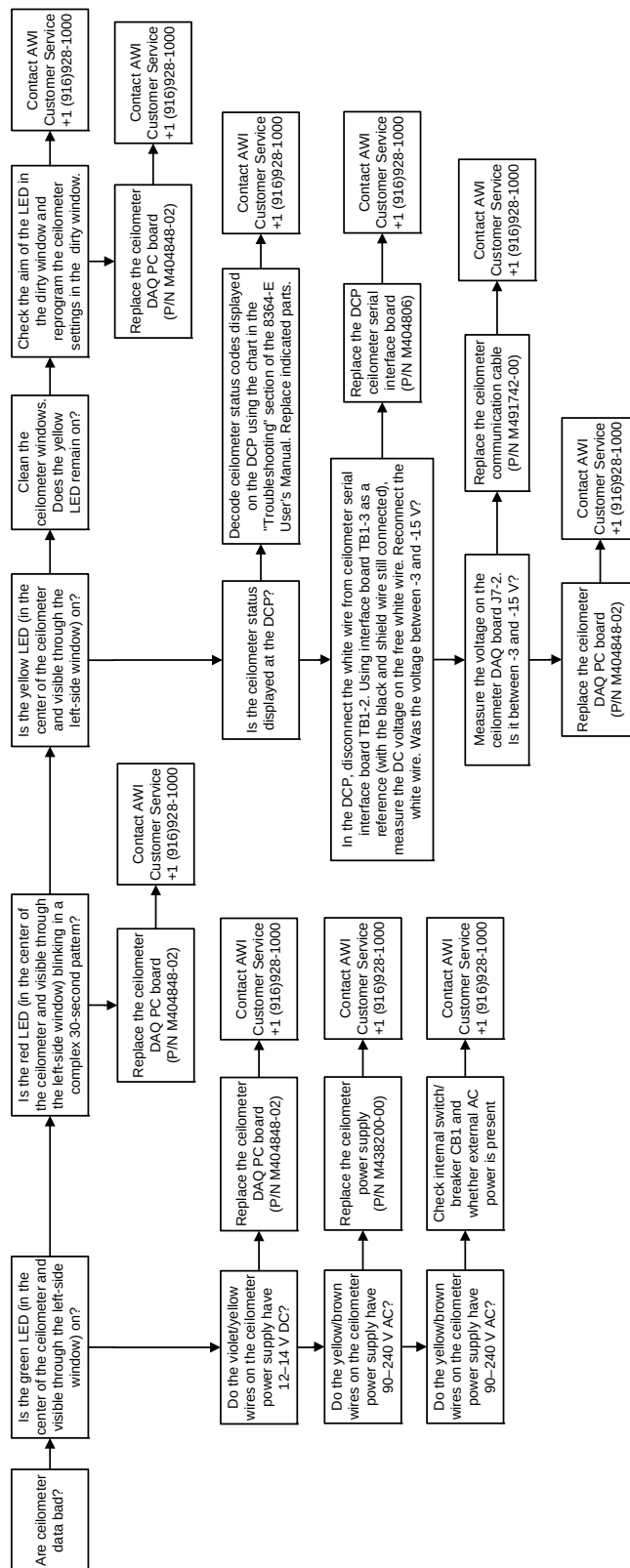
5.4 Wind Direction Sensors



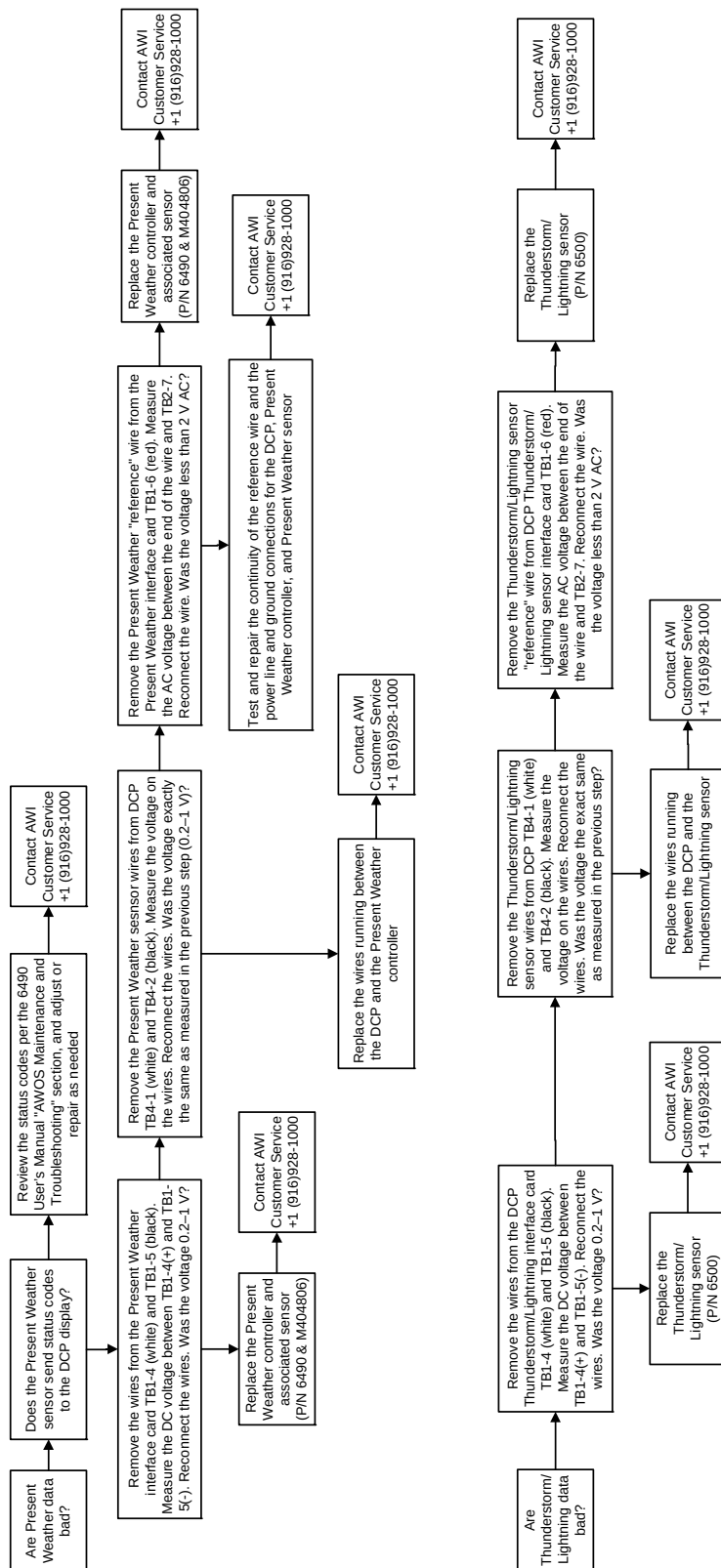
5.5 Visibility Sensor



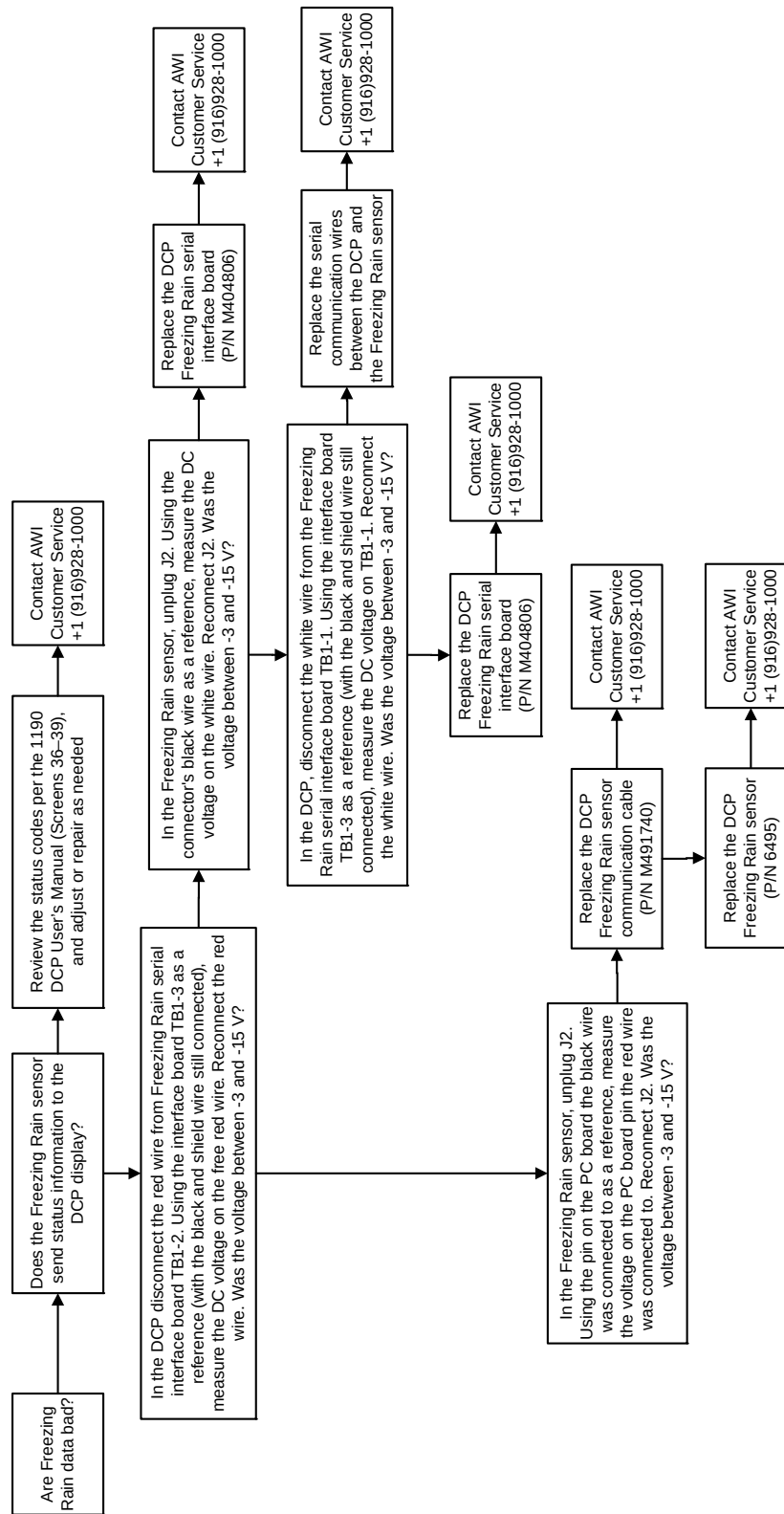
5.6 Ceilometer



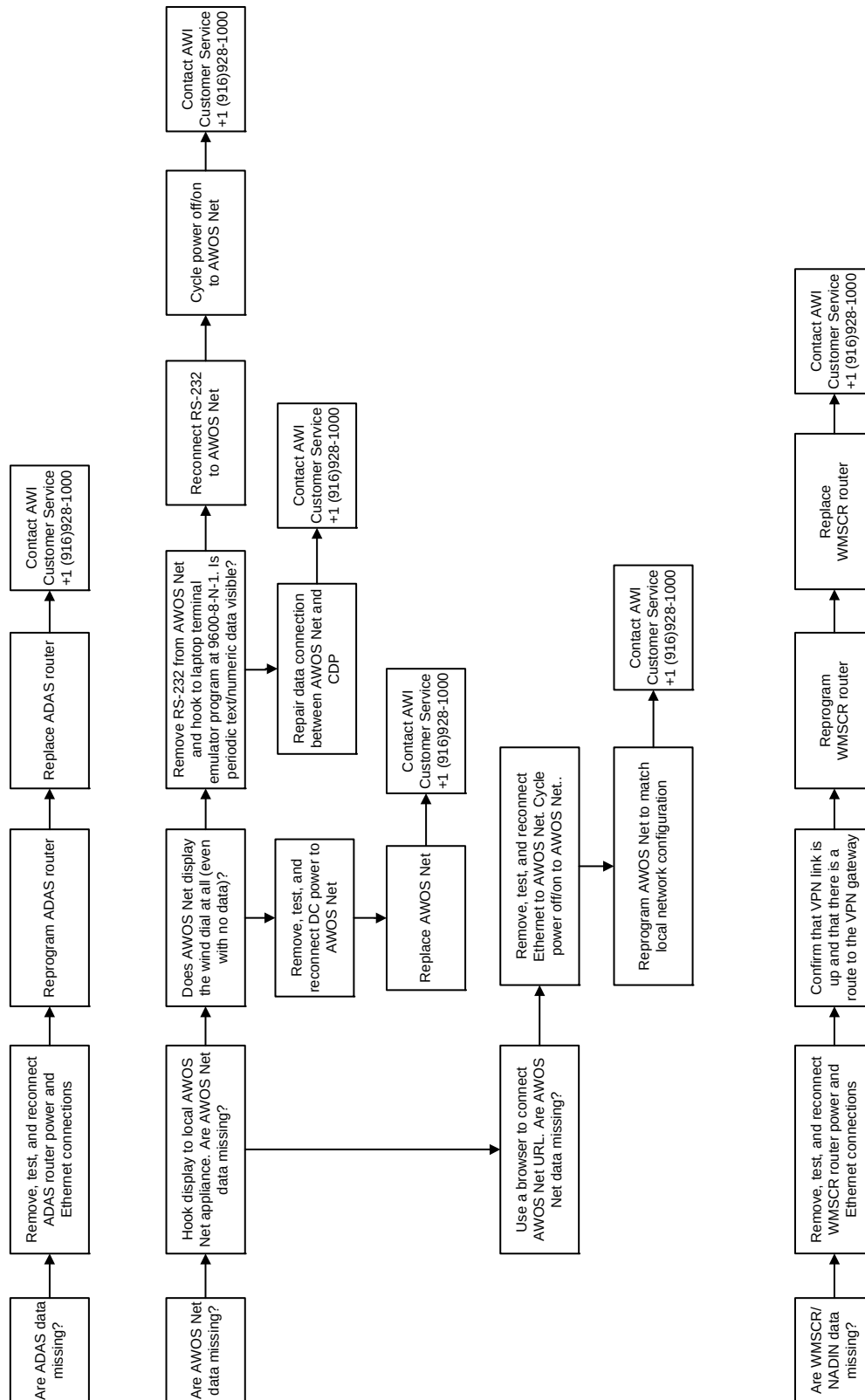
5.7 Present Weather and Thunderstorm/Lightning Sensors



5.8 Freezing Rain Sensor



5.9 Data Networking



Forms

The following pages contain master forms for recording maintenance data. These master forms should be copied and sufficient copies stored at a convenient location in each site's Facility Reference Data File (FRDF). The *Annual Technical Performance Record* is to be completed at system commissioning, after major repair work, and during annual revalidation.

AWOS Monthly Technical Performance Record

Site Name and Location _____ Date _____

General	Completed
---------	-----------

Notify local users AWOS may be missing or unreliable during inspection	_____
--	-------

DCP/Tower	Pass (Y/N)
-----------	------------

Press maintenance switch	_____
Remove debris from all sensors	_____
Check for mechanical damage	_____
Check for movement of wind speed and direction sensors (2020/2030)	_____
Check operation of MARS fan	_____
Check obstruction lights	_____

Sensors	Pass (Y/N)
---------	------------

Check all sensor hardware and cables	_____
Clean Rain Gauge funnel	_____
Check Rain Gauge heaters (6021)	_____
Clean Visibility Sensor optics	_____
Clean Day/Night Sensor optics	_____
Clean Ceilometer optics	_____
Check Ceilometer blower	_____
Clean Present Weather Sensor lenses	_____
Clean Thunderstorm/Lightning Sensor surface	_____
Clean Freezing Rain Sensor probe	_____

Central Data Platform	Pass (Y/N)
-----------------------	------------

Check display operation	_____
Check keyboard and mouse operation	_____
Check printer operation, replace ribbon and paper as necessary	_____
Check system clock	_____
Check microphone by recording a voice remark	_____
Check dial-up by dialing the CDP from an outside line	_____
Check VHF by listening to AWOS voice output from a remote receiver	_____
Check speaker operation	_____
Check UPS operation	_____

Record AWOS Observations	Data
--------------------------	------

Time and Date	_____
Wind Direction	_____
Wind Speed	_____
Visibility	_____
Sky Condition (Clouds)	_____
Precipitation	_____
Present Weather	_____
Thunderstorm/Lightning	_____
Freezing Rain	_____
Temperature	_____
Dew Point	_____
Altimeter Setting	_____
Note any "missing" parameter or any other obvious failures:	_____

System Checked By: _____ Date/Time: _____

AWOS Triannual Technical Performance Record

Site Name and Location _____ Date _____

General			Completed
Notify local users AWOS may be missing or unreliable during inspection			_____
Complete AWOS Monthly Technical Performance Record			_____
DCP/Tower	Expected	Measured	Pass (Y/N)
Drain and clean pressure port			_____
ADC Vref-	0 – 5	_____	_____
ADC Vref+	4090 – 4095	_____	_____
AWOS wind direction seems reasonable	± 30°	_____	_____
AWOS wind speed seems reasonable	± 5 kts	_____	_____
BP1 (Reference Pressure) – (Sensor Pressure)	±0.005 in Hg	_____	_____
BP2 (Reference Pressure) – (Sensor Pressure)	±0.005 in Hg	_____	_____
(AWOS Temp) – (Measured Temp)	±2°F	_____	_____
(AWOS Dew Point) – (Measured Dew Point)	±3°F	_____	_____
DCP shows “MARS Fan Fail” with fuse F1 pulled			_____
Visibility	Expected	Measured	Pass (Y/N)
Rotate sensor to avoid direct sun			_____
Calibration Difference	±3%	_____	_____
Rotate sensor back			_____
Day/Night Sensor changes state			_____
Cloud Height Sensor			Pass (Y/N)
Inspect and clean blower intake and outlets			_____
System status LED (red) alternates between on and fast blink			_____
Battery Status LED (green) is on			_____
Dirty Window LED (yellow) is off			_____
Replace internal desiccant			_____
Present Weather Sensor	Expected	Measured	Pass (Y/N)
Heater check	lens is warm		_____
Carrier raw data field (Xnnn)	405–420	_____	_____
Lnnn	-30 to 50	_____	_____
Knnn	0 to 150	_____	_____
Hnnn	40 to 120	_____	_____
Tnnn	ambient ±5°C	_____	_____
Data field (W__)	blank	_____	_____
Status field (S0000)	all zeros	_____	_____
Thunderstorm/Lightning Sensor			Pass (Y/N)
Check sealant			_____
Freezing Rain Sensor			Pass (Y/N)
Check hardware and cables, clean as necessary			_____

System Checked By: _____ Date/Time: _____

AWOS Annual Technical Performance Record

Site Name and Location _____ Date _____

General			Completed
Notify local users AWOS may be missing or unreliable during inspection			_____
Complete AWOS Monthly Technical Performance Record			_____
Complete AWOS Triannual Technical Performance Record			_____
DCP/Tower	Expected	Measured	Pass (Y/N)
Model 2020/2030 Vane/Cup			
Wind direction align to benchmark			_____
Wind direction linearity 90°;	±3°, no dropouts or irregularities	_____	_____
Wind direction linearity 180°	±3°, no dropouts or irregularities	_____	_____
Wind direction linearity 270°	±3°, no dropouts or irregularities	_____	_____
	±5% (DCP reading shows 359°–001°		
Wind direction linearity 360°	in 355°–005° deadband),		
	no dropouts or irregularities	_____	_____
Wind speed	79 – 81 knots	_____	_____
Wind vane and anemometer bearings turn freely			_____
Model 2040 Ultrasonic Wind			
Zero Wind Check	0 knots	_____	_____
Rain Gauge			Pass (Y/N)
Check for level using built-in bubble level			_____
VHF Radio	Expected	Measured	Pass (Y/N)
Perform the following at the VHF radio			
Output Power Level	2.5 W, ±1 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max.	_____	_____
	Operating: 3.0:1 max.	_____	_____
Frequency	assigned:	_____	_____
	±1.0 kHz	_____	_____
Modulation	65–95%	_____	_____
Perform the following at the VHF antenna when cable runs are longer than 50 ft			
Output Power Level	1.0 W, ±0.5 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max.	_____	_____
	Operating: 3.0:1 max.	_____	_____

AWOS Annual Technical Performance Record (cont'd)

DCP UHF Radio	Expected	Measured	Pass (Y/N)
Power Level	1 W, ± 0.5 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max. Operating: 3.0:1 max.	_____	_____
Frequency	Assigned: ± 1.5 kHz	_____	_____
Deviation	2.4 – 3.8 kHz	_____	_____
CDP UHF Radio	Expected	Measured	Pass (Y/N)
Perform the following at the UHF radio			
Power Level	1 W, ± 0.5 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max. Operating: 3.0:1 max.	_____	_____
Frequency	Assigned: ± 1.5 kHz	_____	_____
Deviation	2.4 – 3.8 kHz	_____	_____
Perform the following at the CDP UHF antenna when cable runs are longer than 50'			
Power Level	0.2W, ± 0.15 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max. Operating: 3.0:1 max.	_____	_____
CDP			Pass (Y/N)
No active alarms/alarms cleared			_____

Comments/Notes:

System Checked By: _____ Date/Time: _____



allweatherinc

All Weather Inc.

1165 National Drive
Sacramento, CA 95818
Fax: 916.928.1165
Phone: 916.928.1000
Toll Free: 800.824.5873

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